**BLUEPRINT FOR PHARMACOLOGY EXAM 2**

**CHAPTER 15 – Drugs for Seizures**

Anti-seizure pharmacotherapy: Mechanism of action and usage (1)

* 3 general mechanisms by which anti-seizure drugs act:
  + **Stimulating** an influx of chloride ions, an effect associated with GABA
  + **Delaying** an influx of sodium
  + **Delaying** an influx of calcium
* The goal of anti-seizure pharmacotherapy is to *suppress* neuronal activity just enough to prevent abnormal or repetitive firing
* Used for an unspecified amount of time (indefinitely)
* Medication brands/type can be adjusted because of adverse side effects, but in general, the medications are used until a patient no longer shows any signs or symptoms to indicate the need

Benzodizepine: Table 15.3 Adverse effects (1)

* Laryngospasm
* Respiratory depression
* Cardiovascular collapse
* Coma
* Drowsiness
* Sedation
* Ataxia

Table 15.3 Barbiturates Adverse effects(1)

* Agranulocytosis
* Stevens-Johnson syndrome
* Angioedema
* Laryngospasm
* Respiratory depression
* CNS depression
* Coma
* Death
* Somnolence

Table 15.3 Newer GABA-Related Drugs Adverse effects(1)

* Serious disfiguring and debilitating rashes
* Sudden unexplained death in epilepsy (SUDEP)
* Withdrawal seizures on discontinuation of drug
* Drowsiness
* Dizziness
* Fatigue
* Sedation
* Somnolence
* Vertigo
* Ataxia
* Confusion
* Asthenia
* Headache
* Tremor
* Nervousness
* Memory difficulty
* Difficulty concentrating
* Psychomotor slowing
* Nystagmus
* Paresthesia
* Nausea
* Vomiting
* Anorexia

Prototype Phenobarbital; Adverse effect /Mechanism of action (2)

* Acts by enhancing the action of GABA neurotransmitter, which is responsible for suppressing abnormal neuronal discharges that can cause epilepsy
* Schedule IV drug – may cause dependence
* Drowsiness
* Vitamin deficiencies
  + (D, folate or B9, B12)
* Laryngospasms
* With overdose, may cause:
  + Severe respiratory depression
  + CNS depression
  + Coma
  + Death

Table 15.4 Phenytoin like drug: adverse effect(1)

* Valproic Acid (prototype phenytoin like drug)
* Adverse effects
  + Agranulocytosis
  + Aplastic anemia
  + Bullous
  + Exfoliative dermatitis
  + Stevens-Johnson syndrome
  + Toxic epidermal necrolysis
  + Bone marrow depression
  + Acute liver failure
  + Pancreatitis
  + Heart block
  + Respiratory depression
  + Dizziness
  + Ataxia
  + Somnolence
  + Headache
  + Diplopia (double vision)
  + Blurred vision
  + Transient indigestion
  + Rhinitis
  + Leucopenia
  + Prolonged bleeding time
  + Nausea
  + Vomiting
  + Anorexia

Prototype drug Phenytoin: administration alerts, Interactions(3)

* Pharm Class: Hydantoin; sodium influx-suppressing drug
* Dilantin (mention was made to Gingival Hyperplasia being the most obvious/seen adverse affect)
* Administration alerts
  + When administering IV, MIX WITH SALINE ONLY, infuse at the max rate of 50 mg/min. Mixing with other meds or dextrose solutions produces precipitate.
  + Always flush or prime with saline before hanging as a piggy back. Minor traces of dextrose solution in the line can cause microscopic precipitate formation, which become emboli if infused. Use an IV line with FILTER when infusing.
  + Phenytoin injectable is a soft-tissue irritant that causes *local tissue damage following extravasation.* Do not use *IM;* inject into a LARGE vein or via a central venous catheter.
  + Avoid hand veins to prevent serious local vasoconstrictive response (purple glove syndrome)
  + ***PREGNANCY CATEGORY D. DO NOT GIVE TO A PREGNANT MOTHER!***
* Interactions
  + Anti-coagulants
  + H2 antagonists

Prototype drug Ethosuximide action and uses (1)

* Pharm Class Succinimide; therapeutic Class
* Action and Uses
  + Drug of choice for absence (petit mal) seizures.
  + Depresses the activity of neurons in the motor cortex by elevating the neuronal threshold.
  + Usually ineffective against psychomotor or tonic-clonic seizures
  + May be given in combination with other meds that better treat tonic-clonic seizures
  + DO NOT abruptly withdraw this med because doing so may induce tonic-clonic seizures
  + Pregnancy Category C

Patient receiving antiseizure drug therapy: Nursing Process-Implementation(4)

* + (2nd box) Why do we continuously monitor the blood levels? The window is very narrow for the therapeutic index too far outside of the “perfect window” will result in toxicity or the intended effect will not be reached.
  + (7th box)Assess the condition of gums and oral hygiene measures. May cause gingival hyperplasia, which increases the risk for oral infections
  + (5th box) Assess for bruising, bleeding, or signs of infection. Antiseizure drugs may cause **blood dyscrasias** AND increased chances of bleeding or infection
  + (9th box) Monitor children for paradoxical (opposite) response to barbiturates (hyperactivity may occur).
  + (10th box) Pregnancy category D means DO NOT GIVE TO PREGNANT WOMEN
  + (11th box) Avoid abrupt discontinuation of therapy (status epilepticus may occur)
  + (1st box) monitor growth statistics in peds patients (drugs and seizures may hinder normal G&D)
  + (3rd box) asses for level of consciousness, orientation or confusion ( may indicate over medication)
  + (4th box) assess for changes in vision, eye pain, rainbow halos (narrow-angle glaucoma can occur in patients taking benzodiazepines (i.e. Valium (diazepam))
  + (6th box) monitor emotional status. (meds may increase mental depression, suicide. Alcohol use or other CNS depressants increase the effects AND THE RISKS)
  + (8th box) encourage lifestyle and dietary changes. Increase vitamins K, B, D and folic acid, Lower caffeine intake, limited or no alcohol (caffeine/nicotine may decrease the effectiveness of the benzodiazepines)

**Chapter 20 – Drugs for Degenerative Diseases of the Nervous system**

Characteristics of Parkinson disease (1)

* Progressive loss of dopamine in the CNS causing tremor, muscle rigidity, and abnormal movements and posture
* Tremors
  + hands and head develop a palsy like motion
  + “pill rolling”
* Muscle rigidity
  + Stiffness resembling arthritis
  + Difficulty bending over or moving limbs
* Bradykinesia
  + Difficulty chewing, swallowing, or speaking
  + Difficulty initiating movement and controlling fine movements
  + Shuffling feet w/o taking normal strides
* Postural Instability
  + Humped over slightly, easily lose their balance
  + Stumbling resulting in frequent falls w/associated injuries

Table 20.2 Levadopa, Sinemet, ropinirole, Selegiline: Adverse Effects(2)

* Acute MI
* Shock
* Neuroleptic malignant syndrome
* Agranulocytosis
* Depression with suicidal tendencies
* EPS
* Fulminant liver failure
* Severe hepatocellular injury
* Dizziness
* Light-headedness
* Difficulty concentrating
* Confusion
* Anxiety
* Headache
* Sleep dysfunction
* Fatigue
* Nausea
* Vomiting
* Constipation
* Orthostatic movements
* Dystonia
* Dyskinesia

Prototype Drug Levadopa: Drug-Drug Interaction/action/administration alert (3)

* Drug- Drug Interaction
  + Tricyclic antidepressants DECREASE effects, increase postural hypotension
  + Antacids containing magnesium, calcium or sodium bicarbonate may increase levodopa absorption, leading to toxicity
  + Pyridoxine reverses antiparkinsonism effects of levodopa
* Action
  + Restores the neurotransmitter dopamine in extrapyramidal areas of the brain
  + To increase effects, combine w/meds like carbidopa, which prevent its enzymatic breakdown
* Admin Alert
  + Patient may not be able to self-administer meds; help may be required
  + Administer EXACTLY as ordered
  + Abrupt withdrawal of drug can result in parkinsonism crisis or neuroleptic malignant syndrome (NMS)
  + Pregnancy category C (animal studies show adverse effect on fetus; no data on humans)

Table 20.3 Benztropine (Cogentin), Benadryl: Adverse effect(2)

* Paralytic ileus
* Cardiovascular collapse
* Dizziness
* Tachycardia (OVER 100 bpm)
* Hypotension
* Sedation
* Nausea
* Constipation
* Dry mouth
* Blurred vision
* Drowsiness
* Nervousness

Nursing Process: Levadopa with carbidopa (implementation-Patient & family education)(1)

* Teach patient to rise from lying to sitting/standing slowly to avoid dizziness or falls (orthostatic hypotension)
* Watch for and report immediately any signs of changes in behavior,modd such as increased aggression/confusion
* Be aware of newly occurring muscle twitching, blepharospasm (in eyelid muscles), greatly increasing tremors, rigidity, sweating or other symptoms and report IMMEDIATELY
* Encourage to maintain a symptom diary if effects seem to diminish as the next dose is due. Review diary w/patient at each visit
* Take meds on empty stomach or avoid taking with high protein meals; avoid excessive consputmptoin of vitamin b6-rich foods (bananas, wheat germ, fortified cereals, green veggie, meat, legumes and avoid multivitamins containing vit b6)
* Importance for coming for follow up lab evals (hepatic and renal function)
* Urine or sweat may darken and undershirts or dress shields may help to avoid staining of clothing
* Be able to state the reason for drug; appropriate dose and scheduling; what adverse effects to observe for and when to report
* Instruct in proper admin guidelines. Encourage maintaining of a med log, noting symptoms or adverse effects along with the dose and timing of meds

Prototype drug Benztropine (Cogentin) Adverse Effect(1)

* Centrally acting cholinergic receptor antagonist
* Adverse effects
  + Dry mouth
  + Constipation
  + Tachycardia
  + Sedation
  + Drowsiness
  + Dizziness
  + Restlessness
  + Irritability
  + Nervousness
  + Insomnia
* Contraindications
  + Narrow angle glaucoma
  + Myasthenia gravis
  + Obstructive diseases of the genitourinary and GI tracts

Drugs for Alzheimer’s disease (the goal of pharmacotherapy)(1)

* Used to SLOW memory loss and other signs of dementia
  + Maintain their ADL’s back
  + Able to have Cognitive behavior as long as possible

Drugs for Alzheimer’s disease Table 20.4 Donepezil, galantamine (general question)(1)

* Aricept
* Serious Adverse effect is Hepatoxicity

**Chapter 21- Drugs for Neuromuscular disorder**

Nursing process: Patient receiving drugs for muscle spasm: Planning & Implementation(1)

* Planning: Patient Goals and Expected Outcomes
  + The patient will:
    - Experience therapeutic effects dependent on the reason the drug is being given (e.g., decreased muscle spasm and pain, improved physical mobility and coordination, and increased ability in self-care activities)
    - Be free from, or experience minimal adverse effects
    - Verbalize an understanding of the drug’s use, adverse effects, and required precautions
    - Demonstrate proper self-administration of the medication (e.g., dose, timing, when to notify provider).
    - Goal is to increase independence
  + Implementation
    - Interventions and (Rationales)
      * Ensuring therapeutic effects:
        + Drug therapy may take several days to have the full effect with lessening pain and tenderness, increased range of motion, and an increased ability to complete ADLs noted. Support the patient in self-care activities as necessary until improvement is observed. (An ability to carry out ADLs gradually improves with consistent usage.)

Prototype drug: Dantrolene (Dantrium) (general question)(1)

* Pharm Class: Direct acting antispasmodic – calcium release blocker (suppresses release of calcium)
* Therapeutic Class: Skeletal muscle relaxant
* Does not affect cardiac or smooth muscle; calcium channel blockers taken w/dantrolene increase risk of Ventricular fibrillation and cardiovascular collapse

Table 21.1 Baclofen, clonazepam, Flexeril-Adverse effect(1)

* Edema of tongue
* Anaphylactic reaction
* Respiratory depression
* Coma
* Laryngospasm
* Cardiovascular collape
* Drowsiness
* Dizziness
* Dry mouth
* Sedation
* Ataxia
* Light-headedness
* Urinary hesitancy or retention
* Hypotension
* Bradycardia

Table 21.2 Skeletal muscle Direct acting Antispasmodic Adverse effect/labs(1)

* Muscle weakness
* Dizziness
* Diarrhea
* Hepatic necrosis – MONITOR ALBUMIN VALUES??

Prototype Dantrolene Contraindications/Interactions(2)

* Contraindications
  + Patients with impaired cardiac or pulmonary function or hepatic disease should not take this drug
* Interactions
  + Drug-Drug
    - Do not take OTC cough preparations & antihistamines, alcohol or other CNS depressants
    - Calcium channel blockers (verapamil) increase risk of Ventricular fibrillation & cardio collapse

Prototype Flexeril Action/ Adverse effect/overdose Tx (3)

* Pharm Class : Catecholamine reuptake inhibitor
* Centrally acting skeletal muscle relaxant
* Action
  + Depressing motor activity primarily in the brainstem; limited effects also accur in the spinal cord
  + Increases circulating levels of norepinephrine, blocking presynaptic uptake.
  + Causes muscle relaxation in cases of acute muscle spasticity, but NOT EFFECTIVE in cases of cerebral palsy.
  + Short term therapy for 2-3 weeks
* Adverse Effects
  + Drowsiness
  + Blurred vision
  + Dizziness
  + Drymouth
  + Rash
  + Tachycardia
  + (Rare) swelling of the tongue
  + *Contraindications*: use with caution patients w/MI, dysrhyhmias or severe cardio disease
* Overdose
  + IV admin of 1-3 mg of physostigmine salicylate

Causes of muscle spasm(1)

* Overmedication w/antipsychotic drugs
* Epilepsy
* Hypocalcemia
* Pain
* Debilitating neurologic disorders
* Excessive use of and local injury to the skeletal muscle

Treatment options for muscle spasm(1)

* Pharmacologic
  + Analgesic
  + Muscle relaxants
* Nonpharmacologic
  + Massage
  + Hydro therapy
  + Hot/cold therapy
  + Supervised exercises

Skeletal muscle relaxants mechanism of action(1)

* Believed to generate their effects within the brain and/or spinal cord by
  + Inhibiting upper motor neuron activity
  + Causing CNS depressant effects or
  + Altering simple spinal reflexes

Types of muscle spasm(1)

* Tonic – single prolonged contraction
* Clonic – multiple, rapidly repeated contractions

Mechanism of action of centrally acting agent and direct acting antispasmodics(1)

* Centrally acting agent
  + Inhibition of motor neurons within the brain and or spinal cord
* Direct acting antispasmodics
  + Interferes with the release of calcium from the storage areas in the skeletal muscle
    - Acts directly on the skeletal muscle does not go through the spinal cord or brain

Treating muscle spasms directly at muscle tissue- Botulinum toxin (1)

* Blocks Ach release from cholinergic nerve terminals
* Usually used in small muscles and with centrally acting oral meds to increase functional use of a range of muscle groups

**Chapter 49**

Mechanism of action of cycloplegic drugs(1)

* Dilate the pupil but also paralyze the ciliary muscle and prevent the lens from moving during assessment.

Pharmacotherapy for minor eye conditions(1)

* Phenylephrin (neo-Synephrine) – Mydriatics: sympathomimetic
* Atropine (isopto atropine) –Cyclolegic: anticholinergic

Prototype Latanoprost Administration alert/Adverse effect(2)

* Admin Alert
  + Remove contact before using eyedrops and DO NOT reinsert contact for 15 minutes
  + Avoid touching the eye or eyelashes with any part of the eyedropper to avoid cross-contamination
  + Wait 5 minutes before/instillation of a different eye prescription to admin eye drop(s)
  + Pregnancy category C
* Adverse effect
  + Conjuntival edema
  + Tearing
  + Dryness
  + Burning
  + Pain
  + Irritation
  + Itching
  + Sensation of foreign body in eye
  + Photophobia
  + Visual disturbances
  + Eyelashes on treated eye may grow thicker and darker
  + Changes may occur in pigmentation of the iris of the treated eye and in the periocular skin

Correct method of administration of eye drops(1)

* Conjunctival sac (pull out bottom lid)

Medication for middle ear infection(1)

* Systemic Antibiotics: usually amoxicillin (dose of 80-90mg/kg/day)

Prototype drug timolol: Interactions(1)

* Drug-Drug
  + May occur if significant systemic absorption occurs
  + Use caution in patients taking other beta-blockers due to additive cardiac effects
  + Concurrent use wth anticholinergics, nitrates, reserpine, methyldopa or cerapamil could lead to hypotension and bradycardia

Table 49.3 Otic Preparation Carbamide peroxide, Polumyxin **ALL** Adverse effects(1)

* Allergic reactions (antibiotics)
* Ear irritation
* Local stinging or burning
* Dizziness

Ear wax softeners(1)

* Carbamide peroxide (Debrox)
* Triethanolamine